

**REFLECTIONS FROM THE INCLUSIVE LUNAR EXPLORATION LUNAR SURFACE SCIENCE WORKSHOP.** K. A. Bennett<sup>1</sup> and P. Prem<sup>2</sup>, <sup>1</sup>U.S. Geological Survey, Astrogeology Science Center, Flagstaff, AZ, 86001, kbennett@usgs.gov; <sup>2</sup>Johns Hopkins Applied Physics Laboratory, parvathy.prem@jhuapl.edu.

**Introduction:** The 13<sup>th</sup> Lunar Surface Science Workshop (LSSW) was titled Inclusive Lunar Exploration. The goal of this session was to begin an open dialogue about how to explore the Moon responsibly, ethically, and inclusively. The LSSW series aims to actively engage the community in planning for the coming years of lunar exploration. Thinking about who is in the room, and how we treat each other, is an integral part of that planning. The workshop took place over two days (January 26-27, 2022). Sessions consisted of both invited and contributed presentations, with open discussions at the end of each session facilitated using Miro collaborative online whiteboards [1]. Here we share some initial reflections from the workshop in advance of the full report expected to be available ~April 2022.

**Day 1 Reflections:** The first day of the workshop focused on diversity and inclusivity in the lunar workforce. The goal was to understand how we can develop and support an inclusive lunar community. The first session was titled ‘Understanding our Community’ and included talks related to demographics and who is missing from our field, as well as different perspectives on the status of diversity and inclusion in our community. The second session, ‘Creating Systemic Change,’ focused on solutions to barriers in our field and included talks from NASA HQ about the inclusion plans that are now required for some proposals, and from researchers who study how to build inclusive and diverse teams from a social science perspective. The third session, ‘Pathways and Bridges,’ focused on how to engage a broader group of people with lunar science and exploration, and how to promote inclusion within the community. Initial reflections from these sessions are outlined below.

**1. Challenges related to diversity and inclusion in the planetary science community have already been demonstrated.** Extensive work has been conducted to understand issues related to diversity and inclusion. As stated by one of the first speakers: “We know there is a diversity problem. We don’t need more demographics studies to tell us that!” [Dr. Julie Rathbun]. These issues were highlighted again during this workshop, both in stories that were shared by participants and research that was presented by social scientists.

One issue raised by Dr. Janet Vertesi is particularly important for the lunar exploration community. It is challenging to regulate “third spaces,” which are non-office or home settings where work takes place (i.e. conferences, field work, mission teams). This can lead

to increased instances of bad behavior and increased levels of informal interactions (i.e. word of mouth, who-you-know) that are barriers to inclusion. Lunar exploration often happens in third spaces at the intersection of institutions, agencies, and industry. This presents a challenge: who is responsible for instituting guidelines in these lunar exploration spaces?

**2. To make progress in addressing these issues, IDEA work must be funded and valued.** Now that more people are aware that there is a problem and communities are starting to focus on addressing these issues, it is critical that the work being done is adequately funded. Expecting this work to happen without designated funding means that it is either exploitative or it will fail due to lack of support.

Equally as important, these efforts must be tangibly valued. This includes making IDEA efforts part of annual performance plans and evaluation metrics. The people who do IDEA work are often part of minority groups. Given that this work does not generally count towards promotion potential, this can result in this group of people having a harder time achieving promotions and/or having to do additional work. One participant noted that they felt like they needed to work overtime because they were attending this workshop, while another wrote that as an early career researcher everything they do is judged for its promotion potential, and anything that does not result in a publication (like IDEA work) is detrimental to their progress.

“An inclusive practice without a budget is not inclusive, it is extractive.”

**Dr. Eleanor Armstrong, invited speaker.**

**3. There are community members who have been working towards a more equitable and diverse workplace for decades, and many potential solutions exist.** Workshop speakers and participants brought decades of experience to the table, and many thoughtful ideas for how to address issues related to diversity and inclusion were discussed. Some actions that were discussed during the workshop: Develop strong mentorship networks and support systems; Create a central location for information and opportunities to reduce reliance on word-of-mouth and who-you-know; Reframe perspectives: adopt the braided river model for workforce development [2] and redefine what success means; Hire social scientists and IDEA experts who have been studying these issues for decades. More examples will be included in the full report.

**Day 2 Reflections:** The second day of the workshop consisted of three sessions on the theme of ethical lunar exploration. The ‘Outer Space for All’ session was intended to highlight a range of different perspectives on space exploration. Talks in the ‘Technical Challenges and Solutions’ session touched on some of the technical aspects of planning for human interactions with planetary environments. Lastly, speakers in the ‘Accountability and Ethical Exploration’ session discussed policies and practices that are or could be applicable to lunar exploration. Initial reflections from these sessions are outlined below.

**1. There is wide-ranging and deep expertise on questions related to ethical and responsible lunar exploration that is not currently given due consideration in decision-making processes.** Space ethics and cultural astronomy are active fields of study, yet experts in these areas are not part of decision-making processes at NASA and many other institutions. This has tangible consequences for the language and culture of space exploration, which directly impact who is included and excluded in our professional spaces and imagined futures. In contrast, economic considerations are often raised in the discourse around lunar exploration – but in a limited way. Many participants voiced concern over decisions driven solely by a narrowly defined profit motive, which does not consider the body of scholarly research and grassroots knowledge related to community stewardship and shared management of resources, and best practices for terrestrial mining.

“I feel like it is very challenging to broach the topic of ethical considerations of non-living environments in many space sector contexts. There are many who value environmental ethics/practices for life-containing environments, but consider that space [environments], absent life, are “dead” and therefore no ethics are needed in terms of land and resource use.”  
**Jessica Heim, participant.**

**2. There is a history of both conflict and relationship-building between NASA (and other space agencies) and Indigenous Nations that is directly relevant to lunar exploration.** Dr. Richard Shope spoke of some of the work done after the Lunar Prospector incident [3] to build trust between NASA and Indigenous communities, which, despite inconsistent institutional support has led to some long-lasting relationships. Current plans by several commercial actors to transport human remains to the Moon in the near future raise the thorny question of how NASA balances its relationships with commercial partners and Indigenous Nations. One recommendation from workshop participants was that NASA follow

other Federal agencies in establishing an Office of Tribal Relations to build and sustain relationships with Indigenous Nations. The establishment of such an Office could also provide clarity on other issues; for instance, one workshop participant noted that “northern Arizona has been a place where astronauts and planetary scientists train, and not always with a clear discussion/inclusion of the significance of that landscape to Indigenous people.”

**3. Broad-based, international engagement and accountability are important for peaceful, ethical, and inclusive lunar exploration.** There was a strong sense at the workshop that broad-based, international consensus on a code of conduct for lunar exploration, rights and responsibilities, and accompanying accountability measures is vital. Speaker Dr. Edythe Weeks made the point that technical and military prowess do not guarantee a lasting peace, and that multilateral consensus is required to prevent conflict. There was also discussion of the need for space policy-making frameworks that involve countries without institutionalized space programs and consider intergenerational equity, and a strong motivation to, as one participant noted, “change the narrative from frontierism to community.”

**4. There are interesting and important science questions and technology challenges that are intimately connected to planning for responsible lunar exploration.** Understanding how to operate responsibly in the lunar environment requires an understanding of the environment itself. One participant at the workshop noted that, “It is impossible to responsibly manage a resource you don’t understand. Lunar ice falls in the “we don’t understand” category.” Participants also discussed the importance of long-term monitoring to understand the impact of human activities on the lunar environment, particularly the tenuous lunar exosphere [Dr. Joel Levine] and their scale relative to natural processes. Another theme that emerged was the importance of long-term planning – addressing issues such as orbital/surface debris management, equipment repair and reusability, waste management, and remediation at the outset rather than as an afterthought.

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**References:** [1] Workshop program available [here](#); [2] Batchelor et al. (2021), *Eos*, 102, doi:10.1029/2021E0157277 [3] ‘Navajos Upset After Ashes Sent To Moon; Nasa Apologizes’, *The Spokesman-Review*, 1/15/1998.